WHAT IS CLAIMED IS:

1. A feed forward amplifier, comprising:

an input for receiving an RF signal;

a main amplifier receiving and amplifying said RF signal;

a pilot signal source coupled between the RF input and the main amplifier;

a main amplifier output sampling coupler;

a first delay coupled to the input and providing a delayed RF signal;

a carrier cancellation combiner coupling the delayed RF signal to the sampled output from the main amplifier;

an error amplifier receiving and amplifying the output of the carrier cancellation combiner;

an error coupler combining the output from the error amplifier and the delayed main amplifier output from the second delay so as to cancel distortion introduced by the main amplifier;

a phase adjuster coupled between the carrier cancellation combiner and the error amplifier;

an output coupled to the error coupler output and providing an amplified RF signal;

a pilot signal detector coupled to the output; and

an adaptive controller, coupled to the pilot signal detector, for controlling the phase adjuster setting to provide a phase adjustment which is offset from a phase adjustment which minimizes the detected pilot signal, which offset is adjustable by changing the floor of a phase adjustment cost function.

2. A feed forward amplifier as set out in claim 1, wherein said pilot signal detector comprises a pilot signal test coupler and a pilot signal receiver.

3. A feed forward amplifier as set out in claim 1, further comprising a second delay coupled between the main output sampling coupler and the error coupler, wherein said second delay is mismatched with the delay of the signal path through the error amplifier.

4. A feed forward amplifier as set out in claim 1, further comprising a gain adjuster coupled between the carrier cancellation combiner and the error amplifier.

5. A feed forward amplifier as set out in claim 4, wherein the controller controls the gain adjuster to provide a gain adjustment which minimizes the detected pilot signal.

6. A feed forward amplifier as set out in claim 1, wherein said adaptive controller comprises a processor implementing a cost minimization search algorithm.

7. A feed forward amplifier as set out in claim 6, wherein said cost minimization search algorithm includes a penalty based on the direction of phase adjustment.

8. A feed forward amplifier as set out in claim 2, further comprising a pilot reference coupler for sampling the pilot signal injected by the pilot signal source and wherein the adaptive controller is coupled to the pilot reference coupler and derives a pilot value from the detected pilot signal and pilot reference signal.

9. A feed forward amplifier as set out in claim 8, further comprising a loop back test switch coupled between the pilot reference coupler and the pilot receiver.

10. A feed forward amplifier as set out in claim 1, wherein said pilot frequency is offset from the RF carrier frequency and wherein said phase adjustment offset corresponds to a shift of center frequency of pilot cancellation to the RF carrier frequency.

11. A delay mismatched feed forward amplifier, comprising:

an input for receiving an RF input signal;

a first control loop coupled to the input and comprising a main amplifier, a main amplifier sampling coupler, a delay element, and a cancellation combiner;

a second control loop coupled to the first control loop and comprising a first signal path, a second signal path comprising an error amplifier, and an error coupler coupling the first and second signal paths, said first and second paths having a delay mismatch;

an output coupled to the error coupler;

a pilot signal source coupled to the first control loop;

means for detecting the pilot signal at the output; and

means, coupled to the means for detecting, for controlling the second control loop to stabilize second control loop cancellation at a center frequency offset from the pilot signal frequency and adjacent the center of the RF signal bandwidth.

12. A feed forward amplifier as set out in claim 11, wherein said means for controlling comprises a phase adjuster in said second control loop and a processor implementing a loop control algorithm and providing variable adjuster settings to said phase adjuster.

13. A feed forward amplifier as set out in claim 11, wherein said means for detecting comprises a second loop test coupler coupled to the output and providing an input to a pilot receiver.

14. A feed forward amplifier as set out in claim 12, wherein said processor and algorithm calculate a cost function associated with the adjuster settings which is derived from the detected pilot signal and a preset floor value of the cost function.

15. A feed forward amplifier as set out in claim 14, wherein said processor and algorithm vary said adjuster settings employing said cost function to move the calculated cost function toward the preset floor value.

16. A feed forward amplifier as set out in claim 15, wherein said processor and algorithm further add a penalty to the cost function if the cost function is at the floor value and the adjuster setting is moving in an undesired direction.

17. A feed forward amplifier as set out in claim 16, wherein the undesired direction corresponds to increasing phase adjuster settings.

18. A feed forward amplifier as set out in claim 16, wherein the undesired direction corresponds to decreasing phase adjuster settings.

19. A method for amplifying an RF input signal employing feed forward compensation, comprising:

receiving an RF input signal and providing said signal on a main signal path;

injecting a pilot signal into said main signal path;

sampling the RF input signal and providing the sampled RF input signal on a second signal path;

amplifying the signal on said main signal path employing a main amplifier;

sampling the main amplifier output;

delaying the sampled RF input signal on the second signal path;

coupling the delayed RF input signal to the sampled output from the main amplifier so as to cancel at least a portion of a carrier component of said sampled output from the main amplifier and provide a carrier canceled signal having a distortion component;

amplifying the carrier canceled signal employing an error amplifier to provide an error signal;

combining the error signal and the output of the main amplifier so as to cancel distortion introduced by the main amplifier and providing an amplified RF output;

detecting the pilot signal in said amplified RF output;

adjusting the phase of the signal input to said error amplifier by a variable phase setting; and

controlling said phase adjusting to a steady state setting offset from a setting which minimizes the detected pilot signal.

20. A method for amplifying an RF input signal employing feed forward compensation as set out in claim 19, wherein said controlling said phase adjusting comprises minimizing a phase control cost function having a floor and a penalty associated with the direction of said adjusting.

21. A method for amplifying an RF input signal employing feed forward compensation as set out in claim 20, wherein said penalty is associated with increasing the phase of the signal.

22. A method for amplifying an RF input signal employing feed forward compensation as set out in claim 20, wherein the frequency of said pilot signal is below the center frequency of said RF input signal.

23. A method for amplifying an RF input signal employing feed forward compensation as set out in claim 20, wherein said penalty is associated with decreasing the phase of the signal.

24. A method for amplifying an RF input signal employing feed forward compensation as set out in claim 20, wherein the frequency of the pilot signal is above the center frequency of the RF input signal.

25. A method for amplifying an RF input signal employing feed forward compensation as set out in claim 20, wherein the floor of said cost function defines a plurality of phase settings having equal cost.

26. A method for amplifying an RF input signal employing feed forward compensation as set out in claim 25, wherein said steady state setting comprises one of said plurality of phase settings having equal cost.

27. A method for amplifying an RF input signal employing feed forward compensation as set out in claim 26, wherein said steady state setting comprises the lowest phase setting having equal cost.

28. A method for amplifying an RF input signal employing feed forward compensation as set out in claim 26, wherein said steady state setting comprises the highest phase setting having equal cost.

29. A method for amplifying an RF input signal employing feed forward compensation as set out in claim 26, wherein said phase control cost function has a lower boundary defined by said floor, said lower boundary having first and second edges.

30. A method for amplifying an RF input signal employing feed forward compensation as set out in claim 29, wherein said steady state setting corresponds to one of said first and second edges of said lower boundary of the cost function.

31. An adaptive controller for controlling a loop of an amplifier system, comprising:

a receiver for receiving a pilot signal; and

a processor coupled to said receiver and programmed with a loop control algorithm to provide as an output phase adjuster settings based on the received pilot signal, the loop control algorithm comprising a cost function having a floor value and a penalty associated with the direction of adjustment of the settings.

32. A method for controlling an amplifier system having a control loop comprising a control loop input, a first signal path, a second signal path, and a control loop output, at least one of said first and second signal path including an amplifier, said method comprising:

detecting a pilot signal at the control loop output;

comparing the detected pilot signal to a floor value;

if the pilot signal is greater than said floor value setting a loop control cost function equal to the pilot signal;

if the pilot signal is less than said floor value, setting the loop control cost function equal to the floor value;

determining the adjustment direction of the loop control;

if the loop control is adjusting in an undesired direction adding a penalty to the floor value to derive a new cost function; and

adjusting the phase of the second signal path so as to minimize the value of the cost function.

33. A method of controlling a control loop of an amplifier system, said control loop having a first signal path and a second signal path, an input and an output, said first and second signal paths having a delay mismatch, said method comprising:

detecting a pilot signal at said output;

adjusting the phase of at least one of said first and second signal paths; and

controlling said adjusting so that said detected pilot signal is at a level offset from a minimum value.

34. A method of controlling distortion cancellation of an RF signal in a control loop of an amplifier system, said control loop having a first signal path and a second signal path, an input and an output, said first and second signal paths having a delay mismatch, said method comprising:

injecting a pilot tone into said RF signal, said pilot tone having a frequency offset from the center frequency of the RF signal bandwidth;

detecting the pilot signal at said output; and

controlling the phase of at least one of said first and second signal paths of the second control loop to stabilize second control loop distortion cancellation at a frequency offset from the pilot signal frequency and generally symmetrical about the center of the RF signal bandwidth.